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| 09/847,479      | 05/02/2001  | Jeffrey J. Brown     | FIS920010077US1     | 6231             |

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EXAMINER

BARRECA, NICOLE M

|          |              |
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| ART UNIT | PAPER NUMBER |
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1756

DATE MAILED: 09/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/847,479

Applicant(s)

BROWN ET AL.

Examiner

Nicole M. Barreca

Art Unit

1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 15 August 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 13-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 1-20 are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-12, drawn to a method for forming an electronic device, classified in class 430, subclass 311.
- II. Claims 13-20, drawn to an electronic apparatus, classified in class 257, subclass 213.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product as claimed may be made by any process, such as selective deposition. (The product claims are written in product-by-process form and therefore the determination of patentability is dependent on the product itself. The product-by-process claims are not limited to the manipulations of the recited steps, only on the product's structure. See MPEP 2113.)

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Frederick Cooperrider on 9/25/03 a provisional election was made with traverse to prosecute the invention of Group I,

Art Unit: 1756

claims 1-12. Affirmation of this election must be made by applicant in replying to this Office action. Claims 13-20 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

5. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

***Claim Rejections - 35 USC § 112***

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 1-12 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 1, 7, 11 and 12 recite "a critical dimension that is below 100 nm". This claim does not meet the description requirement because the phrase "below" has no lower limit and causes the claim to read outside of the disclosed range. While the claims are supported for some dimensions less than 100 nm, such as 75 nm (p.10 of specification), the claims are not supported for all critical dimensions less than 100 nm. See MPEP 2163.05, III.

Art Unit: 1756

8. The applicant argues that they do not currently know the lower limit of the invention. It is therefore unclear as to how the applicant can claim to have possession for this entire range of dimensions, including all dimensions below 100 nm, when they have admitted that they do not know the lower limit. In order to overcome the rejection the applicant is required to either add a lower limit to the range, as supported by the original specification, or delete this open-ended range from the claims.

***Claim Rejections - 35 USC § 102***

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

10. Claims 1, 2, and 7 are rejected under 35 U.S.C. 102(e) as being anticipated by Ng (2002/0142252).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Art Unit: 1756

11. Ng discloses a method for polysilicon trimming. Polysilicon substrate 201 has antireflection coating (ARC) 202 and resist pattern 203 formed thereon having a first critical dimension. In step 320 the structure is lithographically patterned. Then in step 330 the ARC 202 is etched using an O<sub>2</sub> containing gas to performing trimming of the first critical dimension to obtain a second critical dimension. The second critical dimension is about 10-50 nm smaller than the first critical dimension [0038]-[0041]. Figure 2C illustrates examples of different first critical dimensions and the final line widths resulting after the trimming process was performed for different lengths of time, including dimensions of 100 nm, 90 nm and 70 nm [0048]. The conditions for the trim etch include a pressure of about 5-50 mT for about 5-40 seconds. The etching rate is within a specific limit and is dependent on the amount of resist and ARC being used [0042]. The method corrects the nested-isolated offset which resulting in greater across chip line width variation (ACLV) [0047]. The O<sub>2</sub> containing etch is chosen because it is better than other etch chemistries in correcting the offset between the nested and isolated features [0043].

### ***Claim Rejections - 35 USC § 103***

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 1756

13. Claims 3 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ng as applied to claims 1 or 7 above, and further in view of Kim (US 6,233,388) and Jang (US Patent 5,940,719).

14. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ng in view of Kim and Jang.

15. The teachings of Ng have been discussed previously. Ng uses oxygen in the trim etch and does not disclose that the trim etch is an oxygen and nitrogen plasma etch. Kim teaches that when an inert gas, such as nitrogen, is used together with oxygen, the etch rate can be more easily controlled (col.4, 13-17). It would have been obvious to one of ordinary skill in the art to add nitrogen to the oxygen trim etching gas in the method of Ng because Kim teaches that this will allow the etch rate to be more easily controlled.

Ng is silent on the flow rate and power and does not disclose a flow ratio of oxygen to nitrogen between 0.25 and 2.5 or a RF power of 50-200 Watts. Jang teaches that etch recipes factors including the kinds, ratio and pressures of the etch gases and power are varied depending on the etch time (col.5, 44-47). It would have been obvious to one of ordinary skill in the art that the flow gas ratio of oxygen to nitrogen, the RF power and pressure of the trim etch, could be varied depending on the etch time desired because Jang teaches that the kinds, ratio and pressures of the etch gases and power of the etching gases is a result-effective variable which will depend on the etch time. It would have been within the ordinary skill of one in the art to use a flow ratio of oxygen to

Art Unit: 1756

nitrogen of between 0.25 and 2.5 and to use a RF power of 50-200 Watts for the trim etch, if the desired etch time required such an etch recipe. See *In re Boesch*.

16. Claims 4-6 and 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ng as applied to claims 1 or 7 above, and further in view of Yang (US 6,372,651).

17. The teachings of Ng have been discussed above. Ng is silent on the second set of etching conditions for etching the underlying layers and does not disclose etching using CF<sub>4</sub> (5-15 sccm), CHF<sub>3</sub> (5-15 sccm) and Ar (40-200 sccm). Yang discloses a method for trimming a photoresist pattern line for memory gate etching. Following the etching of resist mask pattern lines, the antireflective coating layer 72 is etched using the trimmed resist pattern as an etching mask in a plasma etch chamber in a gas mixture of CHF<sub>3</sub>, CF<sub>4</sub>, O<sub>2</sub> and Ar, at percentages of 10, 20, 10 and 50. (i.e. CHF<sub>3</sub> 10 sccm, CF<sub>4</sub> 20 sccm, O<sub>2</sub> 10 sccm, Ar 50 sccm). This method enables the formation of line widths less than or equal to 0.18 microns (<180 nm). (col.3, 49-54). It would have been obvious to one of ordinary skill in the art to etch the layers underlying the trimmed resist in the method of Ng using a gas mixture of CHF<sub>3</sub> 10 sccm, CF<sub>4</sub> 20 sccm, O<sub>2</sub> 10 sccm, Ar 50 sccm because Yang teaches that this method will form line widths less than or equal of 0.18 microns.

### ***Response to Arguments***

18. Applicant's arguments filed 8/15/03 have been fully considered but they are not persuasive. The applicant argues that Ng does not teach a parameter that tunes the nested/isolated line width variation. However the examiner believes that the teachings in Ng directed to specifically using O<sub>2</sub> in the etching gas mixture for correcting the offset



Art Unit: 1756

between the nested and isolated features meets this claim limitation whereby the etching gas composition is this tuning parameter. The applicant also argues that Ng is not applicable prior art under 103 (c). If the applicant is attempting to claim that Ng and the present application were commonly owned at the time of the invention, the examiner directs the applicant to MPEP 706.02(l) (1)-(2), where there are examples of statements which will provide the proper evidence required to establish common ownership.

***Conclusion***

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicole M. Barreca whose telephone number is 703-308-7968. The examiner can normally be reached on Monday-Thursday (8:00 am-6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 703-308-2464. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



Nicole Barreca  
Patent Examiner  
Art Unit 1756

9/26/03